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(54) IMPROVEMENTS IN OR RELATING TO A PROCESS FOR THE PRESERVATION OF VEGETABLE PRODUCE

(71) I, FRANZ MOHWINKEL, of Haus Nr. 56, Ahlften uber Soltau, Germany, of German nationality, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a process of preserving, in closed packages in cooking autoclaves or cooking receptacles, vegetable produce, of the type usually preserved in cans or bottles, such as potatoes and green vegetables.

It is known to preserve potatoes and green vegetables by canning or bottling them in water. A product is then obtained which can be preserved for a longer period but which, as a result of being stored in a preserving liquid, deteriorates in flavour and loses valuable nutrient substances which are leached out by the liquid. Moreover, canning and, in particular, bottling are expensive and inconvenient and, when buying, the customer cannot see the product in the can, which is a possible disadvantage.

The invention is based on the problem of removing the present disadvantages and producing preserved food which hardly differs in taste from the fresh product and which, even in the wrapped state, affords an appetising appearance.

This problem is solved by means of the process according to the invention for preserving vegetable products, such as potatoes and green vegetables, in closed packages whereby the peeled or shelled produce, which if desired can be comminuted, is vacuum packed in non-rigid plastics containers, whereupon the closed packages are placed in a cooking receptacle and a heating medium, such as water, preferably steam is supplied thereto. The produce in the packages or containers is cooked at temperatures of about 100°C. under an external pressure (i.e. external to the packages, but within the receptacle) exceeding the internal pressure in the package and is finally cooled, while still maintaining the higher external pressure used during the cooking step. The requisite higher pressure is obtained, for instance, by increasing the vapour pressure, which is due to the preserving treatment with steam, by means of a supply of compressed air. If preserving is carried out in a water bath, then the necessary pressure is preferably obtained by supplying compressed air to the steam space adjacent the water level. To ensure that a sufficient excess pressure is maintained in the space around the packages, compressed air is supplied until at the preserving temperature, the entire external pressure considerably exceeds the partial pressure of the water vapour of 1 atms.

The preserving process, which can be a boiling or steaming process, is carried out in autoclaves or cooking receptacles containing water or water vapour. It has been found that when working in the autoclave in an exclusively water-vapour atmosphere, as is usual in using cooking autoclaves, the vacuum-sealed packages therein burst open. Obviously when preserving in packages, apart from the development of water vapour, other gases are released so that the total internal pressure becomes so high that the package bursts open. It has been observed that this undesired effect occurs both in the steam space of an autoclave and in the water bath.

In accordance with the invention, it has now been ascertained that splitting of the packages can be safely avoided if, during cooking, the packages which are filled with the prepared fresh produce and then closed are surrounded with a higher external pressure independent of the cooking temperature. In accordance with the invention, this causes

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the water vapour flowing into the autoclave to mix with the additional cold compressed air. Thus, it can readily be arranged that the vapour passing into the autoclave and filling it is compounded with cold compressed air and this mixture is supplied to the autoclave. It is thus possible to regulate the temperature in the autoclave according to the amount of compressed air added. For example, the temperature of about 120°C., which arises with a pure water-vapour excess pressure of 1 atms., can be reduced to, for example, 100°C. without affecting the excess pressure of 1 atms. A constant temperature of, for example, 100°C. can be easily maintained by continuously passing the corresponding compressed air/water-vapour mixture through the autoclave.

It has been found that, because of the relatively lower temperature with a correspondingly equal excess pressure, the generation of gas in the packaging container, for example, a bag, is so slight that the bag is firmly compressed by the external pressure, so that it no longer bursts open. If it is boiled in the water bath, the water can be heated to about +100°C. in the cooking receptacle by means of a thermostat and a compressed air globe (dome) can be placed in the top of the receptacle by supplying compressed air. The bags, which in known methods are very quickly blown up on heating and press against the surface, remain in position with the process according to the invention and the produce therein can finish cooking without the bags blowing up and/or bursting.

The temperature control, which is carried out independently of pressure according to the invention, has another important advantage, namely that the fresh produce no longer needs to be subjected to too high a cooking temperature which, for example with potatoes preserved without any addition of water, would have a very disadvantageous effect on the quality since it can lead to incrustation and discoloration of the surface of the potatoes. Similarly, delicate vegetables are frequently subject to a disadvantageous discoloration in known methods.

Experiments have shown that, for example in the usual processing of raw potatoes, if they are cooked in vacuum-sealed packages, a considerable amount of gas begins to evolve at a temperature of about +25°C., so that the formation of gas does not take place only when the processing temperature or the boiling point of the processing medium has been reached. The same applies to practically all types of fresh vegetables. The entire process according to the invention must therefore be carried out under the aforementioned higher external pressure.

Even at the end of the cooking time, the pressure surrounding the closed containers must first be higher than the internal pressure which arises or has arisen through the generation of gas inside the package. The packages must therefore also be cooled under pressure. Cooling water is preferably used for cooling the packages. Since particular types of produce, particularly potatoes, only radiate heat very slowly, care must be taken to see that the higher external pressure is maintained as long as the produce is still hot, otherwise it cannot be certain that the packages will not split open.

It is therefore preferable if the autoclave is not opened during the cooling process. Cooling is carried out firstly by the vapour in the space surrounding the packages being forced out with cold compressed air by way of an outlet valve. Because only air and not steam passes out through this valve, cooling water is forced under pressure through a connecting water pipe into the autoclave until all the containers are covered with water. The pressure is then released and the autoclave can be opened.

When cooking in a water bath, the cooling water is likewise forced under pressure into the cooking receptacle, so that the hot water is forced out through a relief pressure valve. Similarly here, the receptacle can be opened after all the containers have been covered with water and then sufficiently cooled.

The preserving time is determined by the particular kinds of produce types involved and can be easily ascertained by simple preliminary tests in each case.

It can be seen that, by using the process of the invention, any sort of produce can be preserved, either in separate individual packages or even in different combinations in one common package. The latter is particularly suitable if packed vegetable and potatoe portions for one meal, put into single packages, are to be made available for consumers. With the process according to the invention it is possible to provide such a single-pack arrangement in a combination which is aesthetically pleasing to the consumer. The cooking time for such packages is determined by the cooking time for the kind of produce which has the longest cooking time.

It has been discovered that even with delicate types of vegetables, such as peas and asparagus, which as a rule can only be bottled with difficulty, bursting of the packages is safely avoided and a satisfactory packaging and preservation can be achieved.

The process according to the invention has the advantage that a produce is obtained which keeps for a longer period of time and which is neither leached out nor deteriorated in appearance and particularly colour compared to the natural product. This produce is available to the used in packages, the quality of which he or she can judge by eye.

Where various kinds of produce, e.g. peas together with carrots and potatoes, are preserved in single packages according to the process of the invention, the housewife has the possibility of using them either at one meal or separately from another. Since the individual types of produce in the prepared state are supplied separately to the containers and after feeding in a certain type the filling space in each single container is divided off from the rest of the space for example by welding (heat-sealing), when cooking, i.e. reheating to make the foodstuffs ready for use, the housewife can serve up the individual kinds separately or bring them to the table in any combination, in accordance with personal taste and choice.

Moreover, since the package material used in the process according to the invention is a disposable package which is very cheap, particularly when compared with known glass containers, washing, return and storage of empty containers, which has been necessary up till now, is no longer required, thus illustrating another technical advantage of the process according to the invention.

EXAMPLE 1

700 g portions of raw peeled potatoes were put into plastic bags. The bags were then evacuated in a vacuum apparatus and welded, i.e. closed by heat-sealing. 300 of such bags each containing 700 g of potatoes were then placed in layers into a 600 litre autoclave regulated for a steam pressure of up to 1.5 atms. and the autoclave was then closed.

The autoclave was connected to a water pipe, a steam/air pipe and a thermometer; furthermore, a regulating valve was located at the top of the autoclave, to control the desired steam pressure.

Firstly, steam with a pressure of 0.7 atms. was admitted to the filled autoclave until the thermometer at the top of the autoclave indicated +100°C. At this point, the steam was removed through the pressure relief valve which had been adjusted to 0.6 atms. A compressed-air line, connected to the steam line leading to the autoclave at about 1 meter away, remained closed by means of a stop valve at the beginning of the heating process. When the thermometer showed +100°C., the air line was opened sufficiently to inject compressed air into the steam so that the temperature remained constant at 100°C. Without the addition of air, the temperature would otherwise rise to +115°C.

By adding compressed air, the pressure was kept constant at 0.6 atms in the autoclave and the thermometer remained practically constant at the desired temperature.

The cooking process lasted about 35 minutes.

After this time, the steam was turned off and the compressed-air valve opened so that only cold compressed air flowed into the vessel. In order to blow the steam out of the autoclave as quickly as possible, compressed air was blown in at 1.5 atms. When most of the steam had been removed through the pressure relief valve after about 5 minutes, the attached water pipe was opened, which then forced cooling water into the autoclave at 2.5 atms. This was continued until water instead of air came out of the pressure relief valve. This indicated that the autoclave was filled with water and thus all the bags had been covered. The temperature recorded on the thermometer had dropped to about +30°C.

The autoclave was then opened and the packages removed and placed in a cooling chamber. The potatoes were then quickly cooled down to +8°C. to +10°C. by the water which flowed into the chamber. They were then packed in cartons.

EXAMPLE 2

400 portions of raw, washed, comminuted carrots were placed in plastic bags each holding 1000 g of produce. They were then placed under vacuum and the filled spaces closed with a welded seam. 200 g of raw, shelled peas were then placed in the remaining empty space and the bags were again placed in the vacuum apparatus and then welded at the open end. As described in Example 1, 300 bags each containing a total of 600 g of carrots and peas were packed in layers. The autoclave was then closed and, as described in Example 1, was set and maintained at the desired excess pressure of 0.6 atms and at a constant cooking temperature of about +100°C.

The cooking process lasted 2½ hours.

After this time, as in Example 1, the steam was turned off and the cooked produce was cooled under pressure until the temperature recorded on the thermometer had dropped to about +30°C. The autoclave was then opened and the packages removed and placed in a cooling chamber with water. The wrapped preserved vegetables were quickly cooled to +8°C. to +10°C. and the packages were then packed in cartons.

WHAT I CLAIM IS:—

1. A process of preserving vegetable produce, such as potatoes and green vegetables, in closed packages, in which peeled or shelled raw produce is vacuum-packed in non-rigid plastics containers which are then treated, in a cooking receptacle, with a heating medium while subjected to an external pressure in the cooking receptacle exceeding the internal pressure in the packages and are finally cooled whilst still subject to the higher external pressure.

2. A process according to claim 1, in which the heating medium is steam.

3. A process according to claim 1 or 2,

in which the higher external pressure is maintained by increasing the vapour pressure present during cooking by means of compressed air.

4. A process according to claim 1, in which the heating medium is water.

5. A process according to claim 4, in which the external pressure required, when using a water bath, is provided by supplying compressed air to the steam space adjacent the water level.

6. A process according to claim 3 or 5, in which the compressed air is admitted so that, at the preserving temperature, the total external pressure considerably exceeds the partial pressure of the steam of 1 atms.

7. A process according to any preceding claim, in which two or more different types of produce are packed and preserved in separate compartments of a single container and separated from each other by welding.

8. A process according to any preceding claim, in which the heating medium is maintained at a temperature of approximately 100°C.

9. A package containing one or more kinds of vegetable produce, when prepared by a process according to any preceding claim.

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